WHAT IS CLAIMED IS:

1. A method to disaggregate asphaltenes in petroleum oils and oil mixtures comprising mild heating.

2. The method of claim 1 further comprising the step of determining the presence of asphaltene aggregates by irradiating said petroleum oils and oil mixtures with neutrons and determining small angle neutron scattering (SANS) intensity, I, as a function of wavenumber, q.

3. The method of claim 2 wherein said neutron scattering wavenumber, q, is in the range 10^{-4} Å$^{-1} \leq q \leq 1$ Å^{-1}, preferably 10^{-3} Å$^{-1} \leq q \leq 10^{-1}$ Å^{-1}.

4. A method to determine the regimes of compatibility and incompatibility of petroleum oils and mixtures of petroleum oils and/or refinery process streams using fitting of $I(q)$ in claim 2 to an equation based on a physical model that contains contributions a strongly decaying feature to describe the surface scattering of asphaltene aggregates at low q, a plateau feature with a rolloff at higher q to describe the asphaltene particles, and a constant to describe the high q incoherent scattering.

5. The method of claim 4 wherein the equation is given by Equation (1).

6. The method of claim 5 wherein the criterion for incompatibility is determined by the concavity of the low-q plateau intensity of the asphaltene particles, I_L, as a function of the volume fraction of mixing, ϕ_m.

7. The method of claim 5 wherein the criterion for incompatibility is determined by the systematic deviation of I_L, as a function of mixing volume fraction from the hard sphere prediction given by Equation (2).

8. The method of claim 5 wherein the criterion for incompatibility is determined by the maximum in the correlation length, given by Equation (2).

9. The method of claim 5 wherein the criterion for incompatibility is determined by the dominance of the low-q value of the surface scattering intensity, I_{surf}, over the sum of the low-q plateau intensity of the asphaltene particles and the incoherent scattering intensity.

10. The method of claim 5 wherein the criterion for incompatibility is determined by the power law exponent, α, exceeding a value of three.

11. A method to estimate the volume fraction of asphaltene aggregates, ϕ_{agg}, in incompatible petroleum oil and/or refinery process stream mixtures based on a difference between the low-q plateau intensity corresponding to the asphaltene particles, I_L, determined in claim 5 at different volume fractions of mixing, ϕ_m, and a prediction for the behavior of this intensity expected for spherical particles interacting by contact repulsions.

12. The method of claim 11 wherein the equation to estimate the volume fraction of aggregates, ϕ_{agg}, is given by Equations (2) and (3).

13. The method of claim 2 wherein the total surface area of asphaltene aggregates per unit volume of the petroleum oil, S_V, is determined from the amplitude of the surface scattering intensity, I_{surf}, from asphaltene aggregates at low wavenumbers, q.

14. The method of claims 12 and 13 wherein the average length scale, R, associated with the internal structures of the asphaltene aggregates is estimated using Equation (4).